

NASA's Astrophysics Cross-Observatory Science Support (ACROSS) Initiative

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NASA Goddard Space Flight Center / Physics of the Cosmos Program Office
WoU Infrastructure for Collaborative Multi-Messenger Ecosystem, October 16, 2023

PhysCOS TDAMM Study

White
Paper:

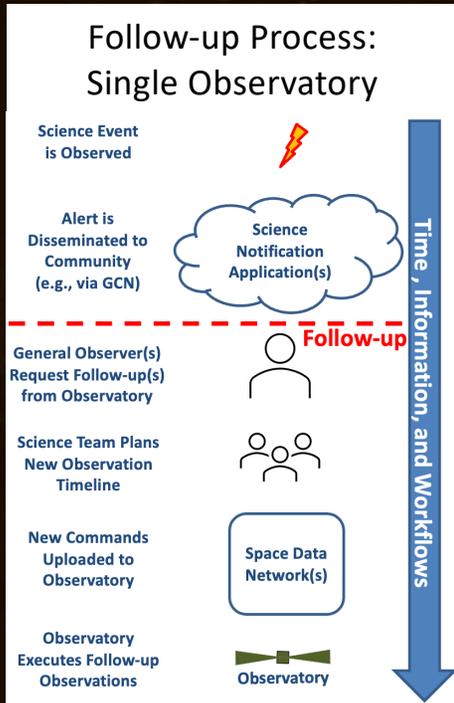


- NASA-sponsored TDAMM workshop in August 2022:
 - White paper and community response articles being published in special issue of Frontiers of Astronomy in 2024.
- In October 2022, NASA HQ directed the Physics of the Cosmos program office initiated a study to identify requirements and formulate implementation options for a TDAMM GOF, in response to Astro2020 TDAMM recommendations.
- Phase 1 of the study investigated the coordination of NASA space-based missions.
- Phases 2-3 of the study (2024-25) will address aspects of NASA space-based mission coordination with ground-based and international facilities.

Summary of Initial Findings: ACROSS

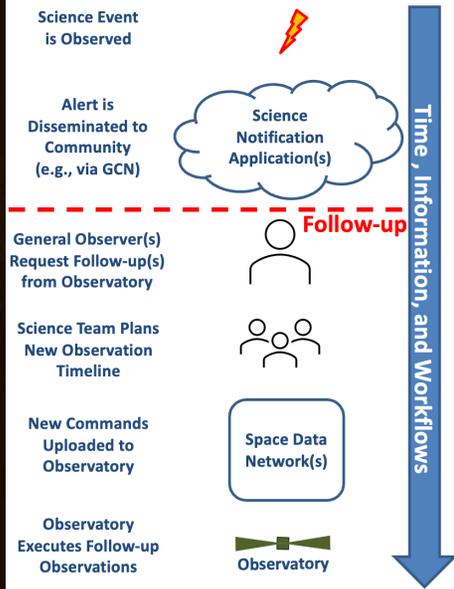
- NASA HQ authorized a two-year pilot phase of the **Astrophysics Cross-Observatory Science Support (ACROSS)** initiative to incentivize and facilitate the planning and execution of TDAMM science cases.
 - ❖ Emphasizing development of cross-observatory science-support tools, operations concepts, and infrastructure to facilitate follow-up observations.
 - ❖ Primary users of ACROSS capabilities are general observers and observatory (mission) science teams.
 - ❖ To incentivize community development of TDAMM cross-observatory science cases, ACROSS is collaborating with mission science teams to develop a general observing competitive research grant solicitation and program, targeting an inaugural call for proposals for 2026.

Where ACROSS Fits

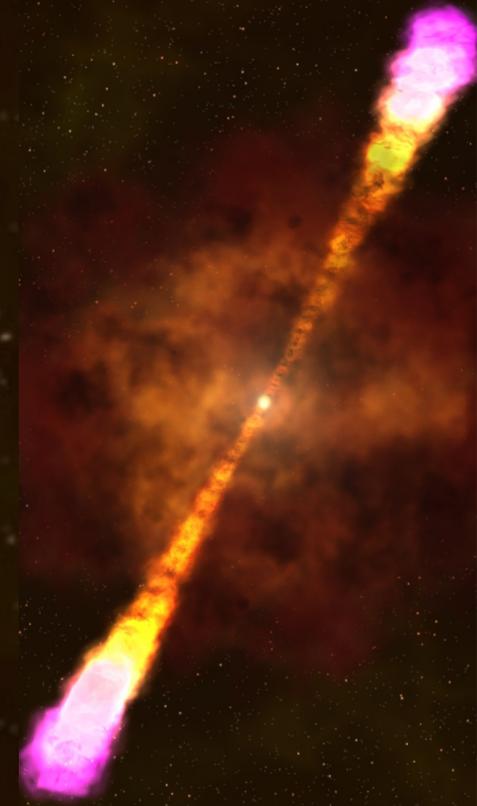
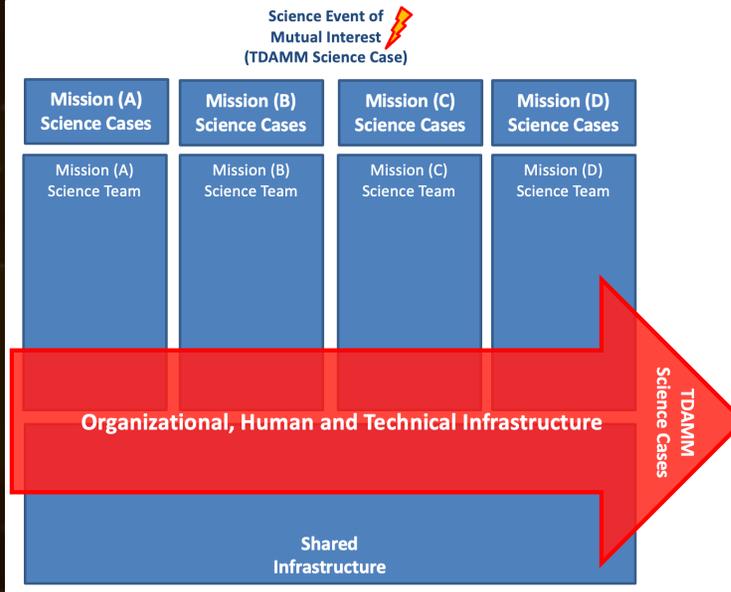


Where ACROSS Fits

Follow-up Process: Single Observatory

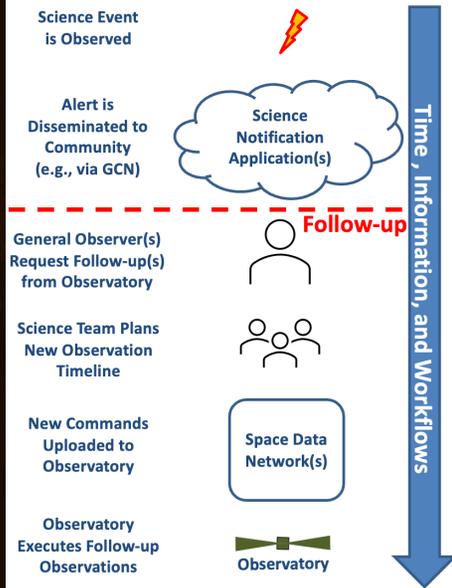


Supporting Follow-up Processes ACROSS the Fleet

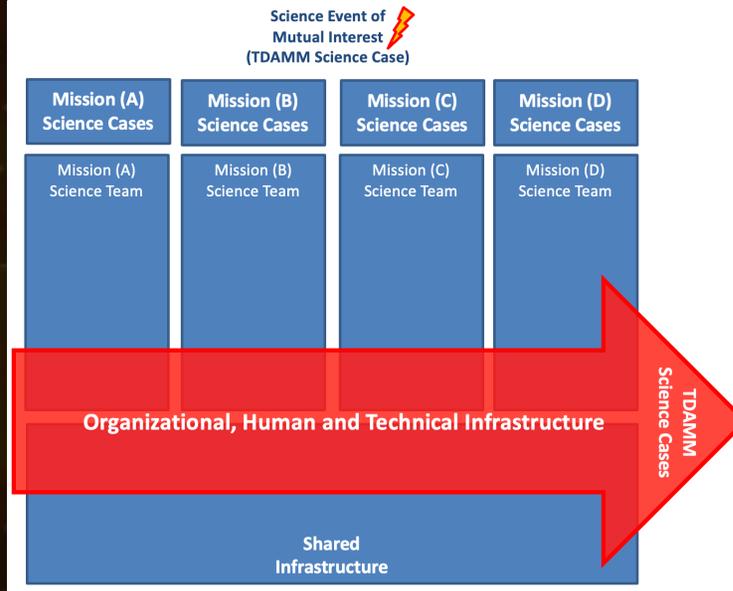


Where ACROSS Fits

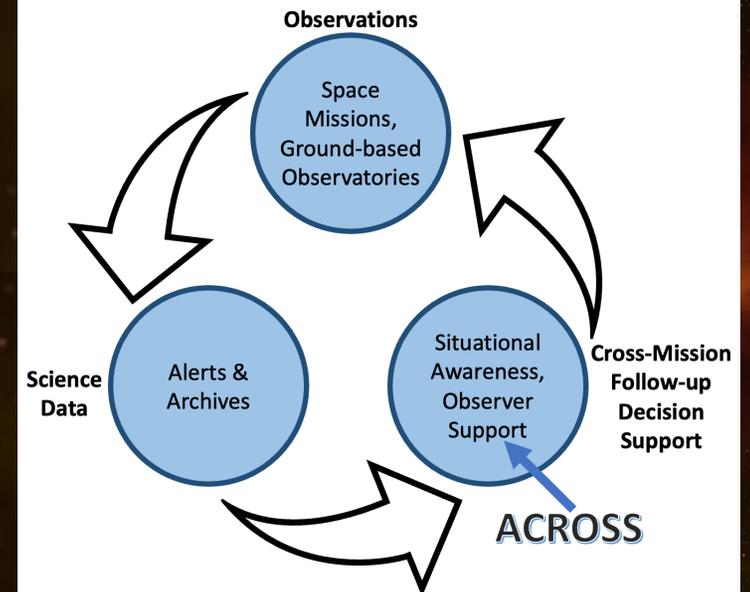
Follow-up Process: Single Observatory



Supporting Follow-up Processes ACROSS the Fleet



ACROSS Strengthens the Feedback Loop



ACROSS Activities

| Science Feasibility Tools | Fleet State & Status Information Streams | |
|----------------------------------|---|---|
| Pointed Instruments | <ul style="list-style-type: none">• Target visibility / observability• Mission target histories | <ul style="list-style-type: none">• Long- and short-term observing plans• Constraints on planning / scheduling feasibility |
| Wide-Field Instruments | <ul style="list-style-type: none">• Whether event of interest was coincidentally detected | <ul style="list-style-type: none">• When it was last within FoV• When it will next be within FoV |
| Keck Observatory | <ul style="list-style-type: none">• Opportunity to prototype interfaces with ground-based facilities | |
| ToO Toolkit | Target of Opportunity pages for new missions (Burstcube, Starburst) | |
| | <ul style="list-style-type: none">• A tailorable software toolkit to assist planning and execution• Enables streamlined, standardized, and automated ToO workflows• Incorporates cross-observatory science feasibility information streams and follow-up decision support tools | |

ACROSS Activities

| Web Portal | Under development, targeting 2024 release |
|------------|--|
| | <ul style="list-style-type: none">• Capability summaries for TDAMM-relevant observatories• Links to ACROSS and community-developed tools• Links to ToO submission pages for all missions• Links to funding opportunities, conferences, and workshops• Events of Interest pages, both static (curated by humans, updated quarterly) and dynamic (built from near-term observing plans and recent observation history for popular ToOs). |

ACROSS Activities

| | |
|------------------------------|---|
| Research Announcement | Under development, targeting 2026 release |
| | <ul style="list-style-type: none">• Targeted at development of tools or observing modes that enable new science cases.• An opportunity for funding of DDT observations made by smaller missions (analogous to flagship DDT opportunities).• An overarching TDAMM science call for proposals designed to streamline or fill the gaps between existing joint observing calls, remove the risk of double jeopardy, and explicitly support observing programs which require coordination between two or more observatories. |
| Community Support | |
| | <ul style="list-style-type: none">• Tutorials and training sessions at the next NASA-hosted TDAMM Workshop, anticipated Fall 2024.• Planned: Helpdesk – to assist in coordinating “ACROSS” multiple observatories. |

ACROSS Timeline

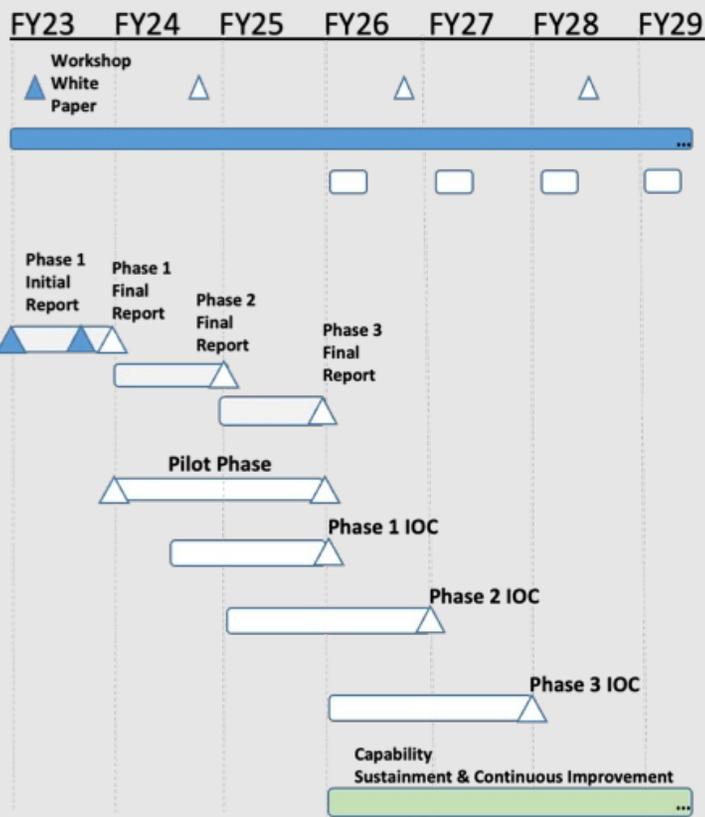
Science Community Engagement

- Series of TDAMM Workshops
- PhysPAG/TDAMM SIG Coordination
- Annual Call for Proposals

System Development

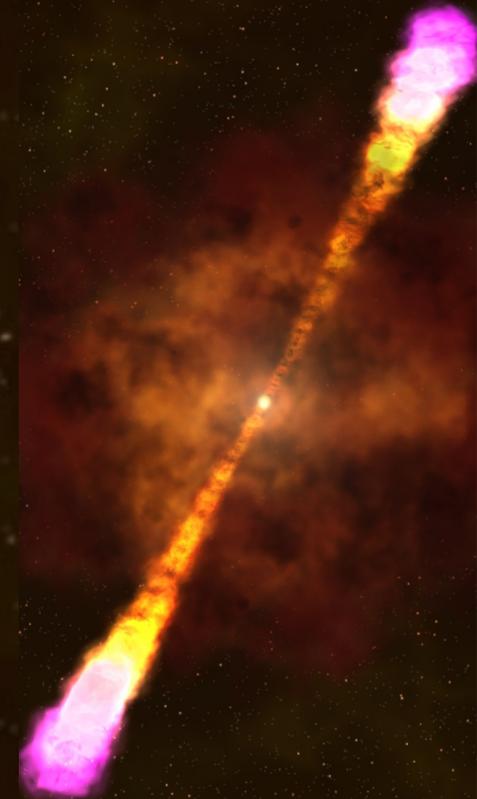
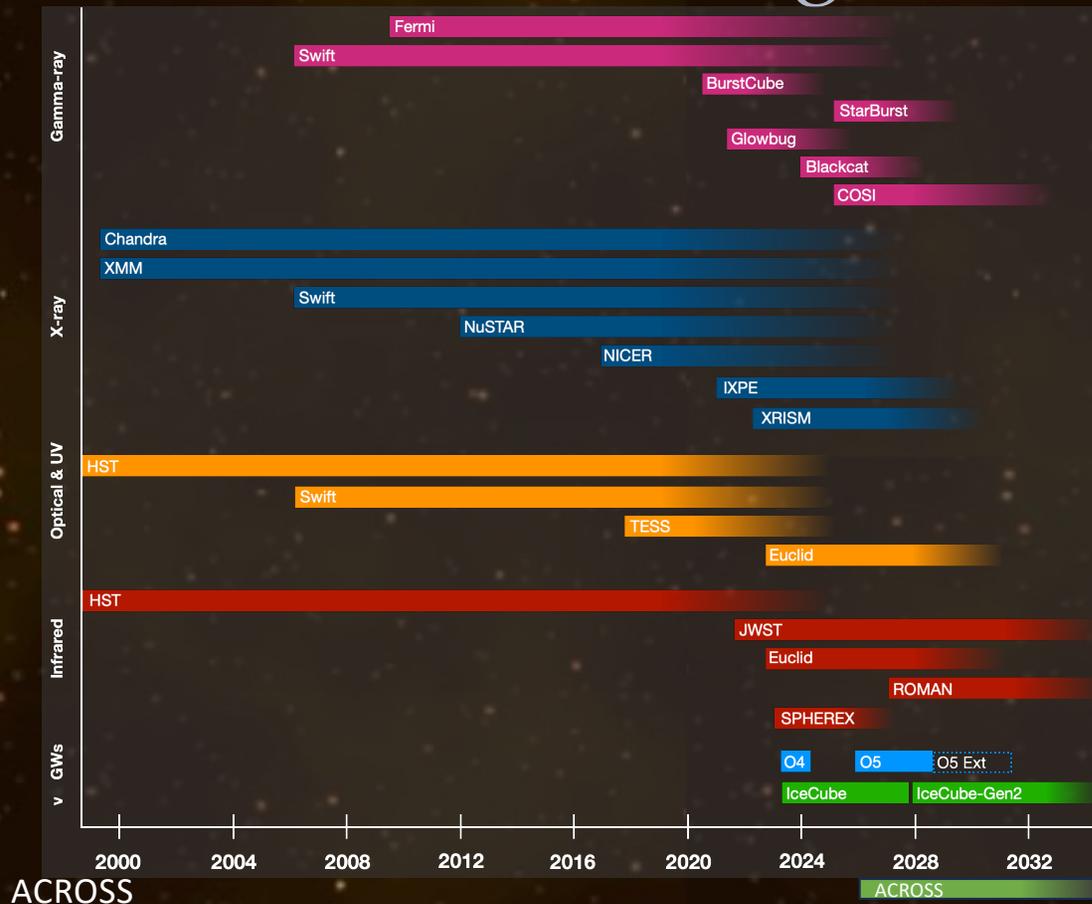
- Study Phase
 - Top Level Requirements, Concepts and Implementation Strategy
- Definition/Development
 - Pilot & prototypes for NASA assets
 - Phase 1 TDAMM Follow Up Capability for NASA Assets
 - Phase 2 TDAMM Follow Up Capability for US Gov Assets (NSF etc.)
 - Phase 3 TDAMM Follow Up Capability for International Assets

Operations



➤ Phases 2-3 of the study (2024-25) will address aspects of NASA space-based mission coordination with ground-based and international facilities.

ACROSS in Multi-Messenger Context



➤ Operations phase and first proposal call timed to be in place for O5 and Gen2.

Backup



PhysPAG Initiatives

➤ TDAMM Science Interest Group

- Chaired by Eric Burns (Phys), Rebekah Hounsell (Phys), Brad Cenko (CO), Ian Crossfield (EXO).
 - Representing all Physics Analysis Groups: Physics of the Cosmos, Cosmic Origins, Exoplanet Exploration.
 - Kick-off event at 243rd AAS in January 2024.

➤ Gamma-ray Transient Network Science Analysis Group

- ❖ Co-chairs: Eric Burns, Michael Coughlin. 50+ SAG members.
- ❖ 70+ pages report delivered to NASA HQ.



GTN SAG
Report

➤ TDAMM Space Communications Science Analysis Group

- ❖ Co-chairs: Jamie Kennea, Judy Racusin. 20 SAG members.
- ❖ Aim to deliver report by the end of the calendar year.



➤ Future Innovations in Gamma-ray Science SAG

- ❖ Lead co-chairs: Chris Fryer, Michelle Hui. Additional co-chairs: Paolo Coppi, Milena Crnogorčević, Tiffany Lewis, Marcos Santander, Zorawar Wadiasingh.
- ❖ Objective: to study science drivers for future gamma-ray missions at all size scales over 5-20 year time horizon.
 - Including TDAMM science cases.
- ❖ Formulating Terms of Reference; targeting kick-off session at the 243rd AAS (January 2024).

Gamma-ray SIG

